4 Acceptance of Materials

Acceptance

Sampling and testing for determination of gradation, liquid limit and plasticity index, and cement content of material, if stabilized, will be performed at the plant and normally no further sampling or testing will be performed for these properties. However, should visual examination reveal that the material in any load is obviously contaminated or segregated, that load will be rejected without additional sampling or testing of the lot. In the event it is necessary to determine the gradation or Atterberg Limits or cement content of the material in an individual load, one sample (taken from the load) will be tested and the results compared to the requirements of Section 208.03 Table II-10, Table II-11 (for one test) and Sec. 307.05(b)(2). The results obtained in the testing of a specific individual load will apply only to the load in question.

Most of the material in a pavement is aggregate. The aggregate contributes strength and stability to the completed pavement. All of the particles needed in the aggregate that will meet specifications and do the job usually cannot be found in a single material; therefore, it becomes necessary to blend different sizes and materials in the proper quantities to produce the desired gradation.

Cement Stabilized Aggregate

Hydraulic Cement can be added to Aggregate Base, Subbase or Select Material to give added strength to the pavement. The cement used must be Type I, I-P or II. The water used in mixing the cement stabilized material must have a pH between 4.5 and 8.5. (Section 307.02 a & b)

The material cannot be shipped to the project until the temperature is 40°F in the shade and rising. (Section 307.04)

Once production has started the contractor has 1 hour from the time of mixing at the plant to have material on the subgrade and start compaction. All compaction must be completed within 4 hours after the water was added at the plant. (VDOT Road. & Bridge Spec. Section 307.05)

Road & Bridge Specifications Section 208.01

Table II-9
Design Range for Dense Graded Aggregates
Amounts Finer Than Each Laboratory Sieve (Square Openings[1]) (% by Weight)

Size No.	**50 mm** 2 inches	**25 mm** 1 inch	**9.5 mm** 3/8 inch	**2.00 mm** No. 10	**425 µm** No. 40	**75 µm** No. 200
21 A	100	94-100	63-72	32-41	14-24	6-12
21B	100	85-95	50-69	20-36	9-19	4-7
22	---	100	62-78	39-56	23-32	8-12

[1] In inches

Road & Bridge Specifications Section 208.03

TABLE II-10
Process Tolerances for Each Laboratory Sieve (%)

No. Tests	**Top Size**	**25.0 mm 1 in.**	**19.0 mm 3/4 in.**	**9.5 mm 3/8 in.**	**2.00 mm No. 10**	**425 µm No. 40**	**75 µm No. 200**
1	0.0	±10.0	±14.0	±19.0	±14.0	±8.0	±4.0
2	0.0	±7.1	±10.0	±13.6	±10.0	±5.7	±2.9
3	0.0	±5.6	±7.8	±10.6	±7.8	±4.4	±2.2
4	0.0	±5.0	±7.0	±9.5	±7.0	±4.0	±2.0
8	0.0	±3.6	±5.0	±6.8	±5.0	±2.9	±1.4

Road & Bridge Specifications Section 208.03

TABLE II-11
Atterberg Limits

Max. Liquid Limit		Max. Plasticity Index	
No. Tests	Subbase and Aggregate Base Type I and II	Subbase Sizes No. 21A, and 22 and Aggregate Base Type II	Aggregate Base Type I and Subbase Size No. 19
1	25.0	6.0	3.0
2	23.9	5.4	2.4
3	23.2	5.1	2.1
4	23.0	5.0	2.0
8	22.4	4.7	1.7

(b) Atterberg Limits: Atterberg limits shall conform to the requirements of Table II-11 when tested in accordance with the requirementts of VTM-7.

Process Tolerance Cement Stabilized Aggregates

No. Tests averaged	Percent Below Design Allowed
1	1.6
2	1.1
3	0.9
4	0.8

Acceptance Calculations for Gradation, Liquid Limit, Plasticity Index, and Cement Content

As previously stated, acceptance, for gradation, liquid limit, plasticity index and cement content will be based upon a mean (average) of the results of tests performed on samples taken in a stratified random manner from each lot. The procedure for calculating the acceptance or failure for gradation, liquid limit, plasticity index, and cement content is as follows:

Step 1. Obtain job-mix formula. The job-mix formula should be that formula as found on Form TL-127 as submitted by the Contractor/Technician for the type mixture being produced.

Example: Stabilized Aggregate Base Type I, No. 21A.

Job-Mix Sieves	Total % Passing
2 in. (50 mm)	100.0
1 in. (25 mm)	95.0
3/8 in. (9.5 mm)	67.0
No. 10 (2.00 mm)	38.0
No. 40 (425 µm)	21.0
No. 200 (75 µm)	10.0
L.L.	Max. 23
P.I.	Max. 2
Cement	4.0%

Note: One week may be required by the Department to evaluate a new job-mix formula.

Step 2. Determine number of tests performed on quantity of material for acceptance. Usually the quantity of material tested for acceptance is a lot (2000 or 4000 Tons), which requires 4 tests (one for every 500 or 1000 Tons).

Example: Lot = 2000 or 4000 Tons = 4 Tests

Step 3. Calculate Acceptance Range. To calculate the acceptance range, the process tolerance for the number of tests performed is applied to the job-mix.

Acceptance Range = Job-Mix ± Process Tolerance

Example: (4 Tests)

Job-Mix Sieves	Total % passing	Tolerance	Acceptance Range
2 in. (50 mm)	100.0	0.0	100.0
1 in. (25 mm)	95.0	± 5.0	90.0-100.0
3/8 in. (9.5 mm)	67.0	± 9.5	57.5-76.5
No. 10 (2.00 mm)	38.0	± 7.0	31.0-45.0
No. 40 (425 µm)	21.0	± 4.0	17.0-25.0
No. 200 (75 µm)	10.0	± 2.0	8.0-12.0
L.L.			Max. 23
P.I.			Max. 2
Cement	4.0	-0.80%	Min. 3.2%

Step 4. Calculate mean (average) of Test results. This is done for each job-mix sieve, Liquid Limit, Plasticity index, and cement content.

$$\text{Mean (average)} = \frac{\text{Sum of Test Results}}{\text{Number of Tests}}$$

Example:

Sample No.	1	2	3	4	Aver.	Acc. Lower	Range Upper	Job-Mix
SIEVE SIZE								
2 in. (50 mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1 in. (25 mm)	93.6	94.6	94.1	89.4	92.9	90.0	100.0	95.0
3/8 in. (9.5 mm)	69.0	70.7	63.9	63.6	66.8	57.3	76.3	67.0
No. 10 (2.00 mm)	42.0	41.6	36.3	36.8	39.2	31.0	45.0	38.0
No. 40 (425 µm)	24.4	23.9	20.0	21.1	22.4	17.0	25.0	21.0
No. 200 (75 µm)	9.4	8.8	7.0	7.7	8.2	8.0	12.0	10.0
L.L.	20	16	27	17	20		23.0	23.0
P.I.	0.0	0.0	0.0	0.0	0.0		2.0	2.0
Cement	3.9	4.2	3.8	4.1	4.0	3.2		4.0

Step 5. Compare mean (average) of test results to acceptance range.

Example: The averages of the lot are within the acceptance range. This lot passes.

Adjustment System - for Aggregate Base and Subbase

Adjustments for Gradation, Atterberg Limits and Cement Content

In the event a lot of material does not conform to the acceptance requirements, adjustment points will be determined as follows:

Sieve No.	Adjustment Points For Each 1% That The Gradation Is Outside The Process Tolerance
2 in. (50 mm)	1
1 in. (25 mm)	1
3/4 in (19 mm)	1
3/8 in (9.5 mm)	1
No. 10 (2.00 mm)	1
No. 40 (425 µm)	3
No. 200 (75 µm)	5

Atterberg Limits	Adjustment Points For Each 1% That The Atterberg Limits Exceed The Maximum Permitted In Table II-11
Liquid Limit	3
Plasticity Index	7
Cement Content	10

In the event the total adjustment is 8.0 percent or less for cement content material, and the Contractor does not elect to remove and replace the material, the unit bid price paid for the material will be reduced at the rate stated herein. The adjustment will be applied to the tonnage represented by the samples: however should any one sample fail by more than 1.6 percent below the design cement content that portion of the lot must be removed from the road. (Section 307.05)

In the event the total adjustment for a lot is greater than twenty-five (25) points, the failing material shall be removed from the road. In the event the total adjustment is twenty-five (25) points or less and the Contractor does not remove and replace the material, the unit price paid for the material will be reduced 1% of the unit price bid for each adjustment point. The adjustment will be applied to the tonnage represented by the sample or samples.

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
2 in. (50 mm)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
1 in. (25 mm)	99.0	99.0	100.0	100.0	99.5	90.0	100.0	95.0	
3/8 in. (9.5 mm)	77.0	88.0	74.1	78.2	79.3	57.5	76.5	67.0	F
No. 10 (2.00 mm)	43.0	40.8	42.2	42.6	42.2	31.0	45.0	38.0	
No. 40 (425 µm)	24.0	23.8	23.6	24.4	24.0	17.0	25.0	21.0	
No. 200 (75 µm)	13.8	13.9	13.8	13.6	13.8	8.0	12.0	10.0	F
L.L.	20	21	21	20	20		23.0	23.0	
P.I.	0.0	0.0	0.0	0.0	0.0		2.0	2.0	
Cement	3.3	2.7	3.1	2.9	3.0	3.2		4.0	F

Sample Calculations for Adjustments:

Step 1. Compute adjustment on 3/8 in. (9.5 mm) Sieve. Refer to the adjustment point table for gradation and note that, for the 3/8 in. (9.5 mm) sieve, a one point adjustment for each 1% that the gradation is outside the acceptance range is applied.

79.3 Average 3/8 in. (9.5 mm) sieve
-76.5 Upper Acceptance Range
2.8% Outside Acceptance Range

1.0 Adjustment for each 1%
x 2.8% Outside Acceptance Range
2.8 Adjustment Points 3/8 in. (9.5 mm) sieve

Step 2. Compute Adjustment on No. 200 (75 µm) sieve. Refer to the adjustment point table for gradation and note for the No. 200 (75 µm) sieve, a 5 point adjustment for each 1% that the gradation is outside the acceptance range is applied.

13.8	Average No. 200 (75 □m) sieve	5.0	Adjustment for each 1%
-12.0	Upper Acceptance Range	x 1.8%	Outside Acceptance Range
1.8%	Outside Acceptance Range	9.0	Adjust. Points No. 200 (75 □m) sieve

Step 3. Compute Adjustment on Cement Content. Refer to Specifications and note that one adjustment point will be applied for each 0.l% the material is out of the process tolerance. This statement means that 10 adjustment points will be applied for each 1% that the material is out; however, the maximum allowable adjustment is 8.

3.2	Lower Acceptance Range	10	Adjustment for each 1%
- 3.0	Average Cement Content	x 0.2	% Outside Process Tolerance
0.2	% Outside Process Tolerance	2.0	Adjustment Points Cement Content

Step 4. Compute Total Adjustment. The total adjustment is the sum of the adjustments for gradation, L.L., P.I. and Cement Content. In our example, we had no adjustments applied for L.L. and P.I.

2.8	Adjustment 3/8 in. (9.5 mm) Sieve
9.0	Adjustment No. 200 (75 □m) Sieve
+ 2.0	Adjustment Cement Content
13.8	Total Adjustment points for Gradation and Cement Content

Section 207.01

TABLE II-6

Design Range: Select Material, Type I

% by Mass of Material Passing

3 in. (75 mm) Sieve	2 in. (50 mm) Sieve	No. 10 (2.00 mm) Sieve	No. 40 (425 µm) Sieve	No. 200 (75 µm) Sieve
100	95-100	25-55	16-30	4-14

Section 207.02

TABLE II-7

Process (P) and Range (R) Tolerance: Select Material, Type I

Tolerance on Each Laboratory Sieve (%)

	3 in. (75 mm)		2 in. (50mm)		No. 10 (2.00mm)		No. 40 (425µm)		No. 200 (75µm)	
No.Test	P	R	P	R	P	R	P	R	P	R
1	0.0		±4.0		±15.0		±10.0		±6.0	
2	0.0	0.0	±3.0	5.0	±10.5	18.5	±7.0	13.0	±4.0	8.5
3	0.0	0.0	±2.5	5.5	±8.5	22.0	±5.5	15.0	±3.5	10.0
4	0.0	0.0	±2.0	6.0	±7.5	23.5	±5.0	16.5	±3.0	10.5
8	0.0	0.0	±1.5	7.0	±5.5	26.5	±3.0	18.5	±2.0	12.0

Adjustment System - Select Material, Type I

In the event a lot of material does not conform to the acceptance requirements, adjustment will be determined as follows:

Sieve No.	Adjustment Points For Each 1% That The Gradation Is Outside The Process/Range Tolerance	
	Process	Range
3 in. (75 mm)	1	1
2 in. (50 mm)	1	1
No. 10 (2.00 mm)	1	1
No. 40 (425µm)	3	3
No. 200 (75 µm)	5	5

Atterberg Limits	Adjustment Points
Liquid Limits	3
Plasticity Index	7

In the event the total adjustment, (EXCLUDING range adjustment) for the lot is greater than 25 points, the failing material shall be removed from the road. In the event the total adjustment, (EXCLUDING range adjustment) is 25 points of less and the Contractor does not elect to remove and replace the material, the unit price for the material will be reduced 1% for each adjustment point. The adjustment will be applied to the tonnage represented by the sample or samples.

Adjustment Calculations on Select Material:

Sample No.	1	2	3	4	Avg.	Range	Lower	Upper	Job-Mix	P/F
Sieve Size										
3 in.(75 mm)	100.0	100.0	100.0	100.0	100.0	0.0	100.0	100.0	100.0	
2 in. (50 mm)	100.0	90.4	95.1	100.0	96.4	9.6	96.0	100.0	98.0	**F**
No.10 (2.00 mm)	50.0	35.4	40.2	42.3	42.0	14.6	32.5	47.5	40.0	
No. 40 (425 µm)	35.0	22.1	25.2	30.4	28.2	12.9	17.0	27.0	22.0	**F**
No. 200 (75 µm)	17.0	11.0	13.1	15.4	14.1	6.0	7.0	13.0	10.0	**F**
L.L.	22	21	22	22	22			23.0	23.0	
P.I.	3.5	0.0	0.0	3.1	1.7			5.0	5.0	

Adjustments are computed as follows:

2 in. (50 mm) sieve: actual range 9.6
maximum range allowed − 6.0
outside acceptance range 3.6

adjustment for each % 1.0
total adjustment 1.0 x 3.6 = **3.6**

No. 40 (425 µm) sieve: average % passing 28.2
upper acceptance range - 27.0
outside acceptance range 1.2

adjustment for each % 3.0
total adjustment 3.0 x 1.2 = **3.6**

No. 200 (75 µm) sieve: average % passing 14.1
upper acceptance range - 13.0
outside acceptance range 1.1

adjustment for each % 5.0
total adjustment 5.0 x 1.1 = **5.5**
Total Lot Adjustment: **3.6 + 3.6 + 5.5 = 12.7**

To: Date: _____

From: Project: _____

Subject: Price Adjustment Route :_____County _____

for Non-Compliance FHWA# _____

Producer: _____

Type of Material: _____

Tons Represented: _____

Date Shipped: _____

The above material does not conform to our requirements by the results below:

Control Test Report Number	Sieve Size	Test Results	Acceptance Range	Fails By	Adjustment Points
	3 in. (75 mm)				
	2 in. (50 mm)				
	1 in. (25 mm)				
	3/4 in. (19 mm)				
	3/8in. (9.5 mm)				
	No. 10 (2 mm)				
	No. 40 (425 µm)				
	No. 200 (75 µm)				
	L.L.				
	P.I.				
	Total Adjustment Points:				

District Materials Engineer

CY: State Materials Engineer
Resident Engineer
District Contract Administrator
Project Inspector
Contract
File

Adjustments for Variability (Standard Deviation)

The Producer shall control the variability of his product in order to furnish a uniform mix. When the quantity of any one type material furnished a project exceeds 4000 tons, the variability of the total quantity furnished will be determined on the basis of the standard deviation for each sieve size. In the event the standard deviation is within the limits shown in the Standard Deviation Table, Table II-12, the unit bid price for the material will be adjusted as indicated hereinafter. Standard deviation computations will not be made separately on more than two job-mixes for the same type material unless a change is requested by the Department.

The unit bid price will be reduced by 0.5% for each adjustment point applied for standard deviation.

The disposition of material having standard deviations larger than those shown in Table II-12 will be determined by the Engineer.

TABLE II-12
Standard Deviation

	No. of Payment Adjustment Points for Each Sieve Size		
Sieve Size	1 Adjustment Point for Each Sieve Size	2 Adjustment Points for Each Sieve Size	3 Adjustment Points for Each Sieve Size
2 in. (50.0 mm)	0.6-1.5	1.6-2.5	2.6-3.5
1 in. (25.0 mm)	4.6-5.5	5.6-6.5	6.6-7.5
3/4 in.(19.0 mm)	5.6-6.5	6.6-7.5	7.6-8.5
3/8 in. (9.5 mm)	7.1-8.0	8.1-9.0	9.1-10.0
No. 10 (2.00 mm)	5.6-6.5	6.6-7.5	7.5-8.5
No. 40 (425 µm)	3.6-4.5	4.6-5.5	5.6-6.5
No. 200 (75 µm)	3.1-4.0	4.1-5.0	5.1-6.0

Control Charts

A control chart is a graphical record of data taken from a repetitive process. The process is in statistical control when repeated measurements from the process behave as random samples dispersed about a target value.

The control chart used for central mix aggregate is based on the bell shaped (normal) curve; the control guides are obtained from standard deviations for the particular sieves. By using these guides and plotting the individual test results, the Producer can predict when the process is getting out of control by using the warning signals that are shown on the chart. When one test results exceeds the number one warning signal, which is 2 standard deviations from the job-mix, the Producer should investigate his process. The reason is that approximately 95% of the material should fall within this range.

When 3 consecutive test results exceed the number 2 warning signal, which is one standard deviation from the job-mix, the Producer should also investigate his process. The reason is that approximately 68% of the material should fall within this range.

When 11 consecutive test results fall on the same side of the job-mix, the Producer should also investigate his process. Eleven (11) is the statistical number that could indicate the job-mix was set on the wrong side and the Producer is not getting full benefit of the process tolerances.

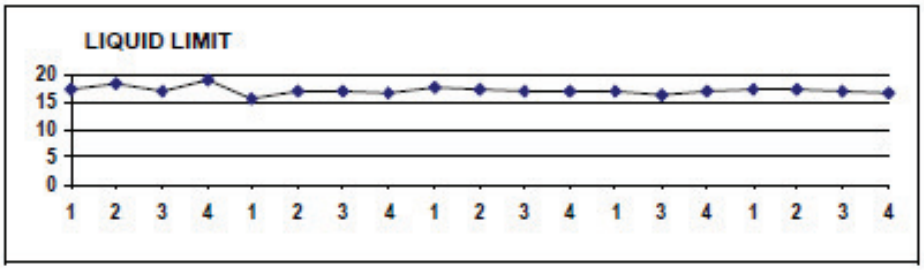
Plotting Control Charts

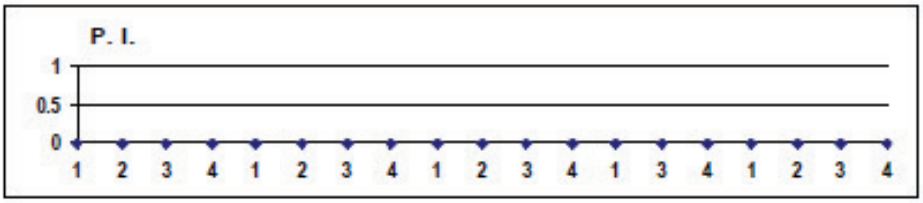
It is our policy now to require the Producer to plot his own Control Charts. If he so desires, we will furnish and set-up the charts, and help him get started in the plotting. The Plant Quality Control Technician will be required to plot the Control Charts.

1. Fill out heading as indicated.
2. Fill in proper job-mix values for appropriate sieves from job-mix formula.
3. Control guides for all sieve sizes are listed at the bottom of sheet. Draw in Control Guides on appropriate Control Sieves in different colors. Example: Red lines for one-point controls and blue lines for three-point controls.
4. As soon as test values have been obtained on an individual sample, plot these values on their proper Control Sieve Chart.
5. After all four samples of a lot have been run, average the test results and plot these over the fourth test number of the lot. Test averages must be plotted in a different color than individual test results.

Project or Maintenance No._____
Contractor_____
Aggregate Size_____

Location:
From_____
To_____
District _____

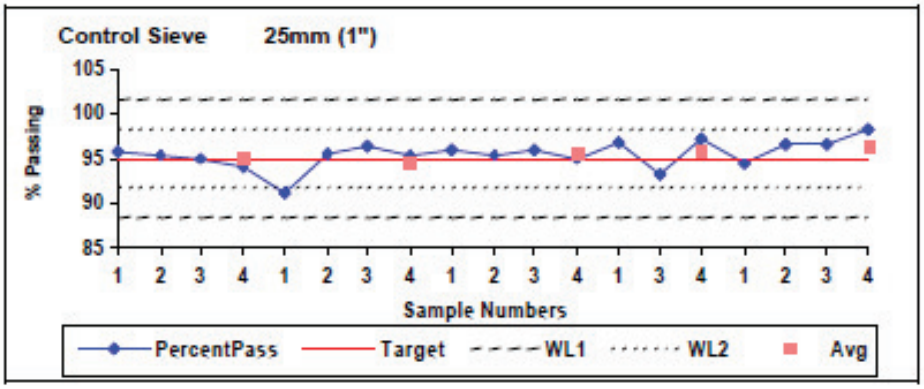




CONTROL GUIDES

WARNING SIGNALS

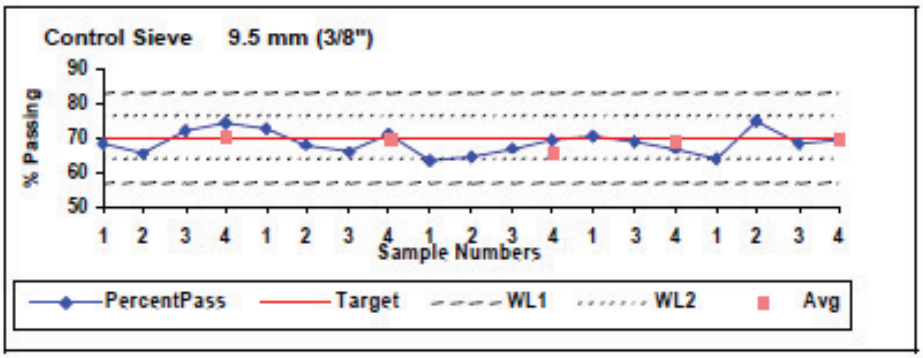
(1) 1 PT. BEYOND ± 6.7%
(2) 3 CONSECUTIVE PTS. BEYOND ± 3.3%
(3) 11 CONSECUTIVE PTS. ON SAME SIDE OF JOB MIX.



CONTROL GUIDES

WARNING SIGNALS

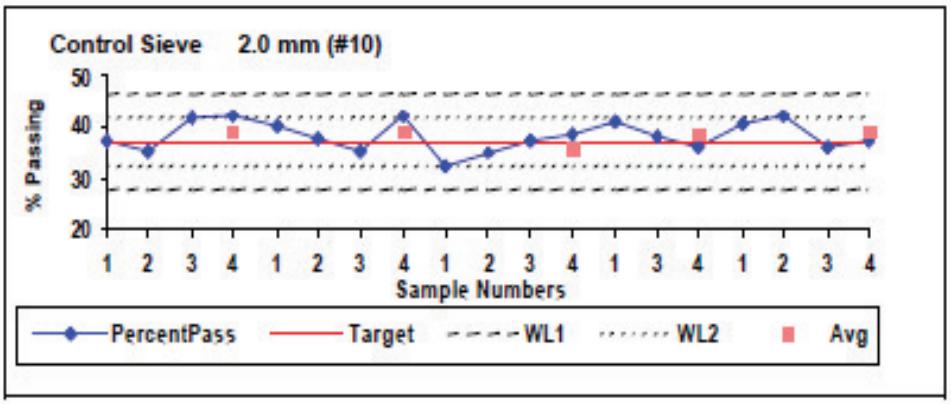
(1) 1 PT. BEYOND ± 12.7%
(2) 3 CONSECUTIVE PTS. BEYOND ± 6.3%
(3) 11 CONSECUTIVE PTS. ON SAME SIDE OF JOB MIX.



CONTROL GUIDES

WARNING SIGNALS

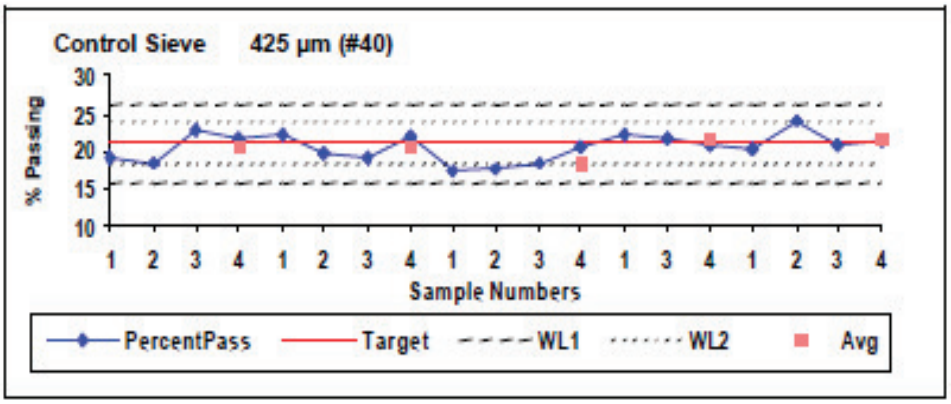
(1) 1 PT. BEYOND ± 9.3%
(2) 3 CONSECUTIVE PTS. BEYOND ± 4.7%
(3) 11 CONSECUTIVE PTS. ON SAME SIDE OF JOB MIX.



CONTROL GUIDES

WARNING SIGNALS

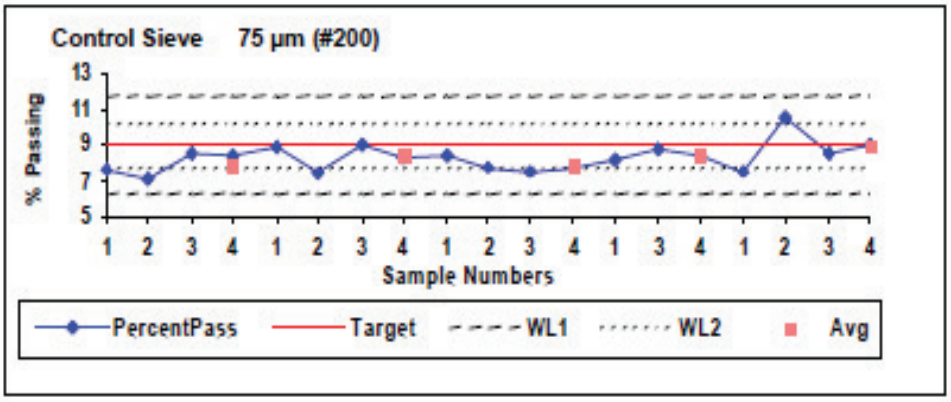
(1) 1 PT. BEYOND ± 5.3%
(2) 3 CONSECUTIVE PTS. BEYOND ± 2.7%
(3) 11 CONSECUTIVE PTS. ON SAME SIDE OF JOB MIX.



CONTROL GUIDES

WARNING SIGNALS

(1) 1 PT. BEYOND ± 2.7%
(2) 3 CONSECUTIVE PTS. BEYOND ± 1.3%
(3) 11 CONSECUTIVE PTS. ON SAME SIDE OF JOB MIX.



Referee System

(a) In the event the test results obtained from one of the four samples taken to evaluate a particular lot appear to be questionable, the Contractor may request that the results of the questionable sample be disregarded, where upon he shall perform tests on five additional samples taken from randomly selected locations on the project where the lot was placed. In the event the Engineer determines that one of the four test results appear to be questionable, the Department will perform tests on five additional samples taken from randomly selected locations on the projectwhere the lot was placed. The test results of the three original (unquestioned) samples will be averaged with the tests results of the five project samples and the mean of the test values obtained for the eight samples will be compared to the requirements for the mean of eight tests as shown in Table II-10 and Table II-11.

(b) In the event the Contractor questions the mean of the four original test results obtained for a particular lot, the Contractor may request approval to perform additional testing of that lot. In the event the Engineer determines that the mean of the four original test results are questionable, the Department will perform additional testing of that lot.The test results of the original four samples will be averaged with the test results of four additional samples taken from randomly selected locations on the project where the lot was placed and the mean of test values obtained for the eight samples will be compared to the requirements for the mean result of eight tests as shown in Table II-10 and Table II-11. If the Contractor requests further tests, the Contractor shall sample and test the material in accordance with Department approved procedures.

In the event the mean of the test values obtained for the eight samples conforms to the requirements for the mean results of eight tests, the material will be considered acceptable. In the event the mean of the test values obtained for the eight samples does not conform to the requirements for the mean result of eight tests, the lot will be adjusted in accordance with adjustment rate specified in Section 208.08. The provisions of this Section will not be applicable to mixes containing cement or other admixtures that alter the characteristics of the material. For Select Material the final mean results will be compared to the requirements for the mean of 8 tests as shown in the Select Material, Type I, Process and Range Tolerance and Allowable Limits.

Knowledge Check
Chapter Four - Acceptance of Materials

1. What types of Portland Cement are allowed in stabilized Central Mix aggregates?

   A. Type I and Type II
   B. Types I, I-P and III
   C. Types I, I-P and II
   D. Types I-P, II and III

2. What are the specification requirements for water used in cement treated aggregates?

3. In the production of cement stabilized aggregate, no one sample shall have a cement content below design by more than ____ percent.

   A. 1.1%
   B. 1.3%
   C. 1.6%
   D. 1.8%

4. If the total adjustment (excluding range adjustment) for the lot is greater than 25 points the failing material has to be removed from the road.

   A. True
   B. False

5. The maximum time interval between manufacture of cement treated aggregate and final shaping and compaction is ____.

6. Is it permissible to accept central-mix aggregate by visual inspection?

7. It is the Department's policy to require the producer to plot his own Control Charts.

   A. True
   B. False

8. If the job-mix formula on the 3/8 in. (9.5 mm) sieve is 68% passing, what is the acceptance range?

9. Can the acceptance range on a sieve fall outside of the Design Range for that particular sieve?

10. The contractor must accept the price adjustment.

    A. True
    B. False

11. The ambient air temperature must be at least_____ before production can start for cement stabilized material.

    A. 50°F
    B. 32°F
    C. 40°F
    D. 90°F

12. A lot is usually an average of:

    A. 2 samples
    B. 6 samples
    C. 8 samples
    D. 4 samples

13. Standard Deviation and variability are the same thing.

    A. True
    B. False

14. The Referee System can only be implemented by the contractor.

    A. True
    B. False

Knowledge Check
Chapter 4 - Acceptance of Material
Problem No. 1

Complete the following test report and calculate the percent of unit price adjustment.
Type Mix – Stabilized Aggregate Base Type I, No.21A

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
2 in. (50 mm)	100	100	100	100				100	
1 in. (25 mm)	96	100	98.5	100				97	
3/8 in. (9.5 mm)	70.9	67.3	74.9	62.8				67	
No.10 (2.00mm)	40.7	39.4	45	34.5				39	
No.40(425µm)	22.5	21.5	25.4	19.7				24	
No.200(75µm)	11.2	13.1	10.4	10.8				10	
L.L.	22	19	21	20				23	
P.I.	2	0	1	0				2	
Cement	3.9	3.2	2.5	2.7				4	

Knowledge Check
Chapter 4 - Acceptance of Material
Problem No. 2

Complete the following test report and calculate the percent of unit price adjustment.
Type Mix – Stabilized Aggregate Base Type I, No.21A

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
2 in. (50 mm)	100	100	100	100				100	
1 in. (25 mm)	100	98	96	97.4				95	
3/8 in. (9.5 mm)	70.8	67.1	62.8	66.7				67	
No.10 (2.00mm)	45	34.5	39.4	38.2				39	
No.40(425µm)	21.3	25.4	20.8	24.1				24	
No.200(75µm)	14.1	9.8	11.1	10.2				10	
L.L.	25	20	21	20				23	
P.I.	5.	0	0.5	0				2	
Cement	3.3	2.5	2.9	2.9				4	

Knowledge Check
Chapter 4 - Acceptance of Material
Problem No. 3

Complete the following test report and calculate the percent of unit price adjustment.
Type Mix – Stabilized Aggregate Base Type I, No.21A

Sample No.	1	2	3	4	Aver.	Lower	Upper	Job-Mix	P/F
Sieve Size									
2 in. (50 mm)	100	100	100	100				100	
1 in. (25 mm)	94.2	91.6	94.4	97.1				94	
3/8 in. (9.5 mm)	68.5	67.4	70.6	61.3				67	
No.10 (2.00mm)	34.2	32.4	34.8	40.9				34	
No.40(425µm)	15.8	14.4	14.5	21.6				16	
No.200(75µm)	8.8	8.7	8	9.9				11	
L.L.	21	19	20	29				23	
P.I.	0	0	0	4.2				2	
Cement	3.3	2.7	2.5	3.5				4	